Mitos P-Pump

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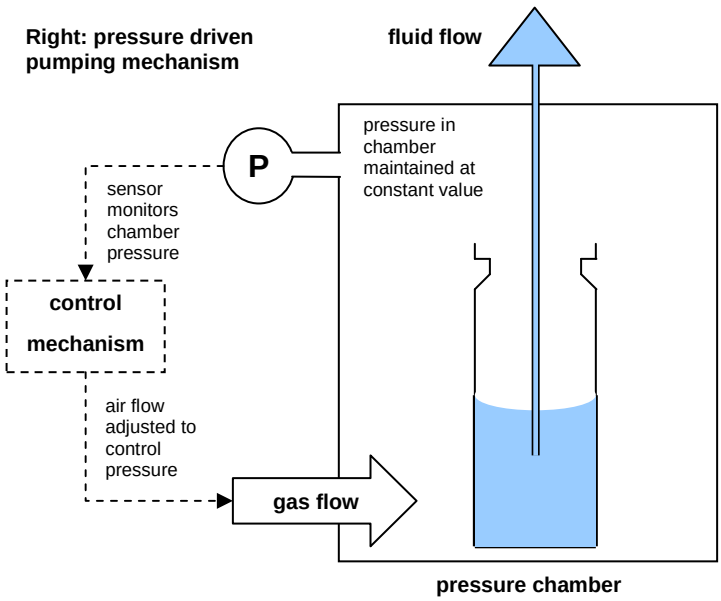
Part name	Part number
Mitos P-Pump	3200016
Mitos P-Pump Basic	3200175
Mitos P-Pump Remote	3200176
Mitos P-Pump Remote Basic	3200177
Mitos P-Pump with 3-way Accessories	3200094
Mitos P-Pump Basic with 3-way Accessories	3200207

Product description

The Mitos P-Pump (Part No. 3200016) provides pulseless liquid flow with a precise pressure driven pumping mechanism. It operates over a wide pressure range (0 – 10bar) with excellent response time and accuracy. The design features a lockable pressure chamber for safety, which is easy to access and accommodates a wide range of fluid vessels. User control is via an intuitive twist-and-click knob and display. Pressure driven flow is ideal for microfluidic systems where highly stable flow is required in the nl/min to µl/min range for applications such as droplet formation.



Main benefits

- Pulseless pumping performance
- Fast response time
- Wide pressure range enabling use with systems of high fluidic resistance
- Accommodates a wide range of fluid vessels (standard and non-standard)
- Quick and easy to set-up and run, with intuitive control
- Works with laboratory N_2 or Ar supply, gas bottle or compressor
- Uses samples direct from your container – no mess and no waste
- Closed-loop flow control option (with Mitos Flow Rate Sensor in-line)

Why choose the Mitos P-Pump?

The Mitos P-Pump (pulseless pressure pump) is the right choice for:

- Better and faster results in microfluidics
- Flow smoothness even at very low flow rates
- Pumping viscous liquids through small channels
- Reducing dead volume and sample waste

What about syringe pumps?

Syringe pumps are good for general purpose lab use, but have performance limitations. The stepper motor drives used in syringe pumps move forward in small steps, which introduces pulsations into the flow. The level of pulsation is determined by the system elasticity. Low elasticity (rigid tubing and rigid microfluidic device) results in high levels of pulsation. High elasticity (elastic tubing, elastic microfluidic device and the presence of gas bubbles) acts to damp out much of the pulsation.

System Elasticity	Specification	Syringe Pump	P-Pump
Low	**Flow Smoothness**	± 25% (typical value)	± 0.1%
High		± 3% (typical value)	± 0.1%
Low	**Response and Settling Time**	seconds	< 4s
High		minutes	< 4s

Importance of smooth flow:

- Small variations in the flow rate cause a big flow disruption in microfluidic channels
- Smooth flow gives precise control over chemical reactions and biological processes
- Smooth flow ensures predictable and repeatable results when working with liquids on a small scale
- Mechanisms such as droplet formation require smooth flow to give consistent droplet size

Closed-loop Flow Control

Closed-loop flow control is an enhancement to the Mitos P-Pump system for improved control of flow rates from 70 nl/min to 5 ml/min. It requires that a Mitos Flow Rate Sensor (Part No. 3200096 – 3200100) is connected in-line between the pump and the microfluidic device. Once the pump detects that a flow rate sensor is connected, the flow control menu options are enabled. A target flow rate can then be set on the P-Pump and the pump pressure is automatically adjusted to meet the target flow rate.

System for Flow Control: Mitos P-Pump (Part No. 3200016) with Mitos Sensor Display (Part No. 3200095) and Mitos Flow Rate Sensor (Part No. 3200096 – 3200100)

The key benefits of closed-loop flow control are:

- Control flow rates instead of pressure making experiments easier to set-up and optimise.
- Improved flow rate precision: even better control over introduction of micro-scale reagent volumes.
- Ideal for droplet generation: higher long-term droplet monodispersity in flow control mode compared with pressure control mode.

Product specifications

	P-Pump specification	Value
1	Pressure range	0 – 10bar (0 – 145psi) gauge
2	Pressure resolution	0.001bar (0.01psi)
3	Pressure stability	0.1% of system pressure; min ± 0.002bar
4	Response and settling time (1 bar step)[1]	< 3s
5	Response and settling time (5 bar step)[1]	< 4s
6	Time for initial pressure response[2]	10ms
7	Maximum rate of response[3]	3bar/s (44psi/s)
8	Pressure supply connection	Quick connect port to Ø6mm OD tube
9	Maximum supply pressure	11bar (160 psi) gauge
10	Chamber dimensions	Ø30 x H 88mm
11	Sample volume	Accepts a wide range of vials and vessels from 100µl to 30ml (higher on request)
12	Dip tube size	1/16" OD; 250µm ID
13	Product size	L 239 x W 93 x H 146mm
14	Product weight	2kg
15	Wetted materials	User selected vessel and dip tube (e.g. glass and PTFE)

1) Time for pressure to rise and settle within 5% of target pressure. Dependent on operating conditions.
2) Time for mechanical system to respond to software command.
3) Maximum rate of response is obtained with maximum supply pressure.

Software Features

- Set pressure target and view change in actual pressure
- Quick vent function to stop flow at the touch of a button
- Countdown timer to pump for a desired period of time (ideal for dispensing small liquid volumes)
- Moving mode where the user dynamically controls the pressure target using the twist-and-click knob and the P-Pump follows this moving target (useful for precise control of liquid movement on-chip or observing the effect of small pressure changes on a system)
- Option to operate in pressure units of mbar, bar or psi
- USB data export to allow pressure control data to be viewed on a PC example Excel spreadsheet

Accessories - overview

The pump will be supplied with the following items:

- User manual
- Pneumatic supply tubing: 6 mm OD, 3m length, quick connect fitting
- Tubing FEP 250µm ID, 1/16” OD, 2m length
- Power supply
- Mains IEC lead

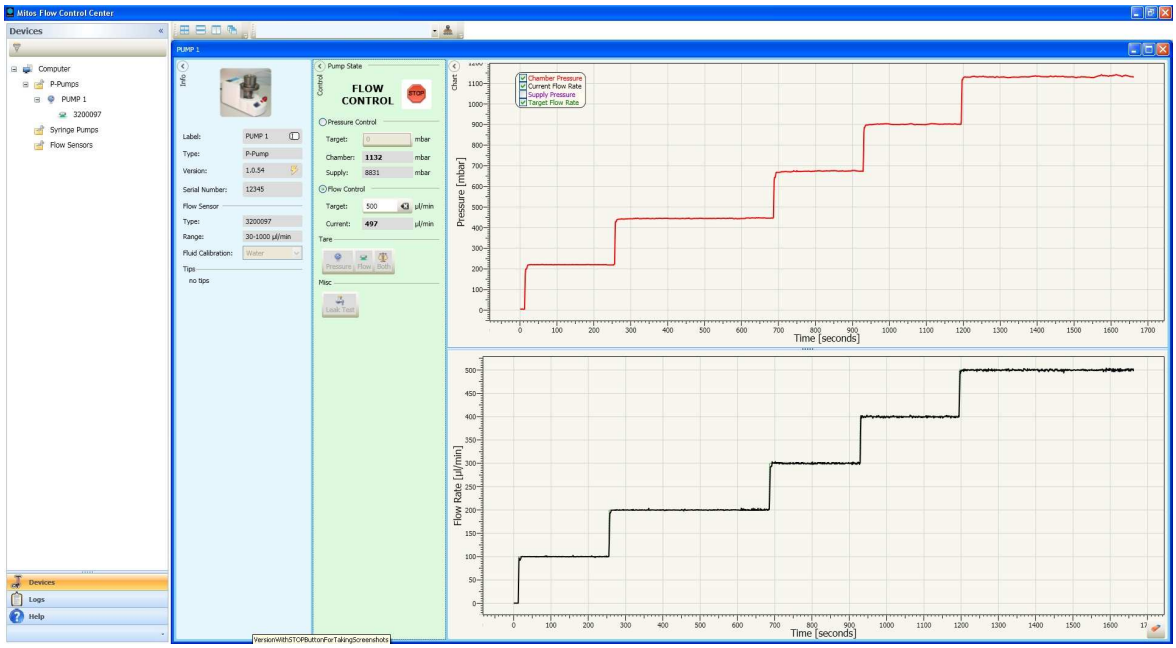
The following accessories are available for use with the pump:

Part name	Part number
Mitos P-Pump Remote Chamber 400	3200043
Mitos P-Pump Remote Chamber 30	3200178
Mitos P-Pump 3-way Chamber Lid	3200044
Mitos P-Pump 3-way Vessel Holder Kit	3200045
Mitos P-Pump Flow Resistors	3200028 - 3200032
Custom Flow Resistor Kit	3200049
Flow Resistor F0.1	3200135
Mitos P-Pump Vessel Holder Kit	3200017
Mitos P-Pump Starter Kit	3200033
Pneumatic Connector Kit	3200034
Mitos Compressor	3200117, 3200018
Dip Tube Fitting	3200143
USB to RS232 Adaptor Cable	3200197

For more information please look at the Mitos P-Pump Accessories datasheet.

Additionally, a PC software suite is available enabling the pump to be controlled from a PC application, or from your own control software:

- a Windows application for setting, charting and logging pressure on 1 or more P-Pumps
- a Windows DLL providing a simple API to access the core P-Pump functionality
- a sample C#/.NET application using the DLL
- a set of LabVIEW VIs and sample application using the DLL



PC application for use with the Mitos P-Pump

Using our extensive software library, we can also control and integrate with a wide variety of other hardware from a range of other manufacturers. Please contact us for further information on developing customised software based on your specific requirements.

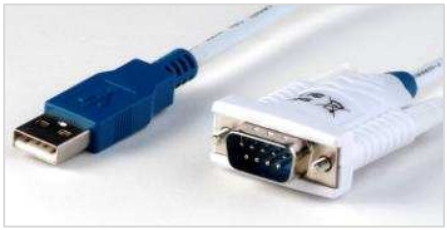
Mitos P-Pump Basic (Part No. 3200175)

The Mitos P-Pump Basic connects to a PC via RS232 serial interface allowing data logging and control using free PC software. For PCs that do not support an RS232 serial interface, Dolomite offer a USB adapter cable (Part No. 3200197).

All the other features of the pump are the same as for the Mitos P-Pump (Part No. 3200016) including pulseless pumping performance.

Left: Mitos P-Pump Basic (Part No. 3200175)

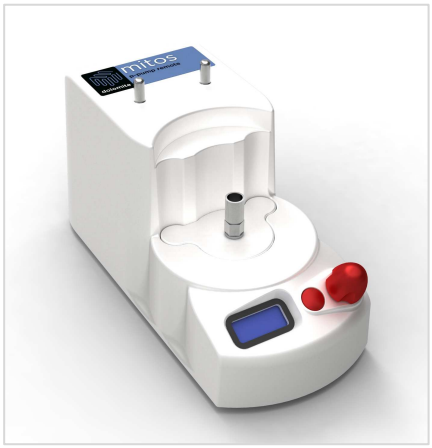
Below: USB to RS232 Adaptor Cable (Part No. 3200197)



Mitos P-Pump Remote (Part No. 3200176)

Based on Mitos P-Pump technology, the Mitos P-Pump Remote is a versatile solution for creating pulseless fluid flows. Using the intuitive twist-and-click knob and display, users can accurately control pressure in a wide pressure range of up to 10bar.

The Mitos P-Pump features an innovative pneumatic fitting which allows users to simply attach Dolomite Remote Chambers or custom chambers with a push-click action reducing downtime between experiments. Multiple remote chambers can be used which are easily accessible for cleaning or sterilisation broadening experimental possibilities and increasing efficiency within microfluidic systems.



Mitos P-Pump Remote (Part No. 3200176)

Mitos P-Pump Remote Chamber 30 (Part No. 3200178)

For applications requiring temperature control or agitation of particles, a remote chamber can be connected and placed on a hotplate, magnetic stirrer or incubator.

The Mitos P-Pump Remote can be used with Dolomite's Mitos P-Pump Remote Chamber 30 (Part No. 3200178), a lockable glass pressure chamber which contains fluid samples from 100µl to 30ml.

	Mitos P-Pump Remote specification	Value
1	Pressure range	0 – 10bar (0 – 145psi) gauge
2	Pressure resolution	0.001bar (0.01psi)
3	Pressure stability	0.1% of system pressure; min ± 0.002bar
4	Response and settling time (1 bar step)[1]	< 3s
5	Response and settling time (5 bar step)[1]	< 4s
6	Time for initial pressure response[2]	10ms
7	Maximum rate of response[3]	3bar/s (44psi/s)
8	Pressure supply connection	Quick connect port to Ø6mm OD tube
9	Maximum supply pressure	11bar (160 psi) gauge
10	Product weight	<2kg
11	Wetted materials	User selected vessel and dip tube (e.g. glass and PTFE)

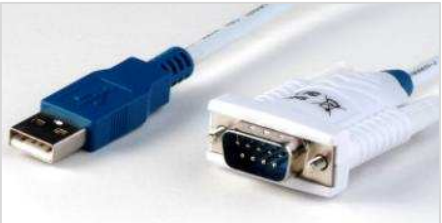
Mitos P-Pump Remote Basic (Part No. 3200177)

The Mitos P-Pump Remote Basic connects to a PC via RS232 serial interface allowing data logging and control using free PC software. For PCs that do not support an RS232 serial interface, Dolomite offers a USB adapter (Part No. 3200197) as shown below.

All the other features of the pump are the same as for the Mitos P-Pump Remote (Part No. 3200177) including pulseless pumping performance and easy to use pneumatic fitting.

Left: Mitos P-Pump Remote Basic (Part No. 3200175)

Below: USB to RS232 Adaptor Cable (Part No. 3200197)



Mitos P-Pump with 3-way Accessories (Part No. 3200094)

The Mitos P-Pump with 3-way Accessories is the Mitos P-Pump with 3-way Chamber Lid (Part No. 3200044) and 3-way Vessel Holder Kit (Part No. 3200045). It can be used to pump 3 liquids simultaneously from separate micro tubes in the Mitos P-Pump (Part No. 3200016). This provides a low cost method of delivering 3 reagents to a microfluidic system with pulseless pressure pump technology.

3200094 - Mitos P-Pump with 3-way Chamber Lid and 3-way Vessel Holder

Benefits

- Provides a low cost solution for 3-channel pumping with the Mitos P-Pump
- 3-way chamber lid that is quick to open and close
- 3-way vessel holder and micro tubes for easy pumping from 3 locations
- Pulseless pumping performance of the Mitos P-Pump

The Mitos P-Pump 3-way Accessories include:

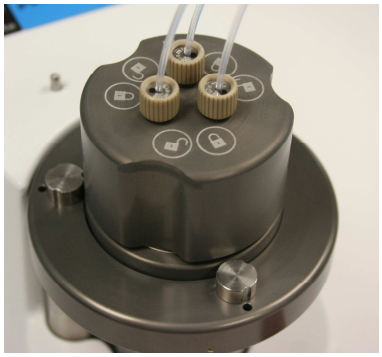
Item		Description	Qty
1	P-Pump body	Mitos P-Pump without standard single port lid	1
2	3200044 3-way Chamber Lid	P-Pump lid with 3 dip tube outlets (for 1/16” OD tubing) and 10 x plugs for blocking unused ports	1
3	3200045 3-way Vessel Holder Kit	3-way vessel holder with 20 x 1.5ml micro tubes	1

Mitos P-Pump Basic with 3-way Accessories (Part No. 3200207)

The Mitos P-Pump Basic with 3-way Accessories is the Mitos P-Pump Basic with 3-way Chamber Lid (Part No. 3200044) and 3-way Vessel Holder Kit (Part No. 3200045). It can be used to pump 3 liquids simultaneously from separate micro tubes in the Mitos P-Pump Basic (Part No. 3200175).

The Mitos P-Pump Basic connects to a PC via RS232 serial interface allowing data logging and control using free PC software.

3200175 - Mitos P-Pump Basic



3200044 - Mitos P-Pump Basic with 3-way Chamber Lid

3200045- 3-way Vessel Holder Kit

Benefits

- 3-way chamber lid that is quick to open and close
- 3-way vessel holder and micro tubes for easy pumping from 3 locations
- Pulseless pumping performance of the Mitos P-Pump

The Mitos P-Pump Basic with 3-way Accessories includes:

Item		Description	Qty
1	3200175 Mitos P-Pump Basic	Connects to a PC via RS232 serial interface allowing data logging and control using free PC software	1
2	3200044 3-way Chamber Lid	P-Pump lid with 3 dip tube outlets (for 1/16” OD tubing) and 10 x plugs for blocking unused ports	1
3	3200045 3-way Vessel Holder Kit	3-way vessel holder with 20 x 1.5ml micro tubes	1

Custom options

Please contact Dolomite if the P-Pump specification does not meet your requirements. If you require a greater reservoir volume, temperature and humidity control, flow sensor feedback, PC interface or an OEM module, Dolomite will work with you to provide a solution.

The Dolomite Centre Ltd.
Unit 1, Anglian Business Park, Royston,
Hertfordshire, SG8 5TW, United Kingdom

T: +44 (0)1763 242491
F: +44 (0)1763 246125
E: info@dolomite-microfluidics.com
W: www.dolomite-microfluidics.com

Dolomite Microfluidics
29 Albion Place
Charlestown, MA 02129

F: 617 848 1211
F: 617 500 0136
E: salesus@dolomite-microfluidics.com
W: www.dolomite-microfluidics.com